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Black Pineleaf Scale

George Ferrell[1]

The black pineleaf scale (*Nuculaspis californica* (Coleman)) belongs to a group of sucking insects called armored scales. Concealed under their protective shells, these scales insert their mouthparts into their hosts, removing sap and, possibly, injecting toxic enzymes secreted in the saliva.

Armored scales are important pests of agricultural and ornamental plants; heavy infestations of black pineleaf scale can severely weaken or kill host conifers. Infestations are generally localized, sometimes in just a few trees, and are reported frequently in sugar and Monterey pines. Occasionally, however, epidemics cover several thousand

[1]Forest Entomologist, U.S. Department of Agriculture, Forest Service, Pacific Southwest Forest and Range Experiment Station, Berkeley, CA. The original leaflet was written by George R. Struble and Philip C. Johnson in 1964.

acres of forest, and nearly every host tree in the area may be infested. Large areas of Jeffrey and ponderosa pines in northeastern and southern California, for example, have had recurring infestations since 1940.

The black pineleaf scale is widely distributed in North America (fig. 1). Its hosts include Mexican pinyon pine, lodgepole pine, shortleaf pine, Jeffrey pine, sugar pine, ponderosa pine, Monterey pine, pitch pine, and Digger pine. It also attacks Douglas-fir and white fir.

Effects on Host Trees

Endemic populations of up to one scale per 2 inches (5 cm) of needle do not noticeably damage healthy trees. However, large populations reduce the number, length, and retention period of the needles. Heavily infested ponderosa pines seldom retain their needles more than 2 years (normal retention is 3 to 5 years). When infestations reach 20 to 30 scales per inch of needle—and remain at these high levels for several years—the tree produces fewer, shorter, and more yellowish needles each season until it can produce no more. Radial growth and terminal growth are also reduced. At this stage, the weakened tree may be attacked and killed by bark beetles.

Where scales have fed, the needles are often blotched with yellowish necrotic areas. These discolored areas are more pronounced in the spring, when they are not obscured by new foliage. By fall, affected needles drop off and leave the tree with sparse, short foliage (fig. 2). On heavily infested trees, scale

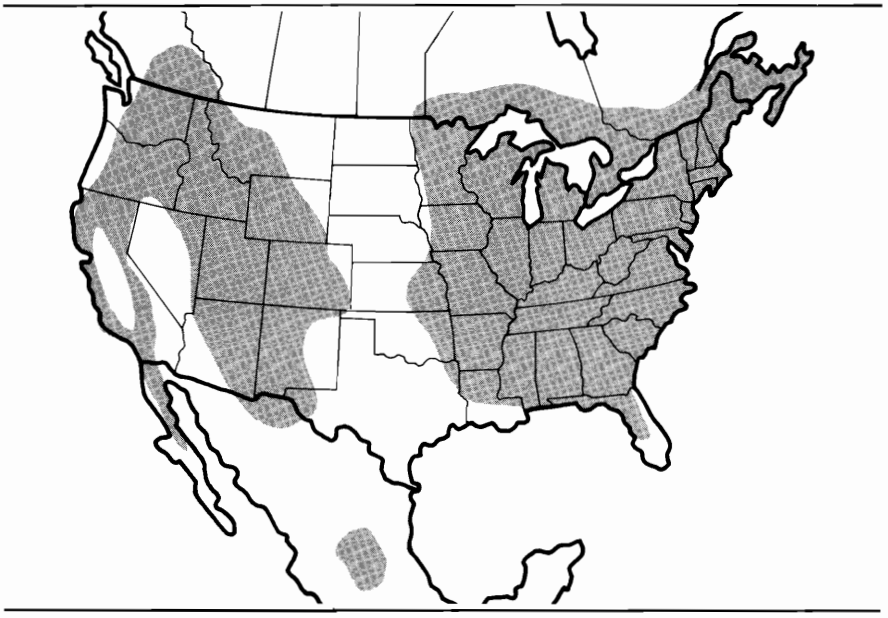

Figure 1—*Distribution of black pineleaf scale. It has been reported in the continental United States, in Canada, and in the mountainous areas of Mexico.*

bodies, often tightly packed against each other, can be seen along the needles. (See cover photo. Scales are magnified approximately eight times.)

Figure 2—*Scale-infested ponderosa pines near Burney in northeastern California.*

Biology

The insect passes through three life stages: egg, nymph, and adult.

The yellowish eggs are nearly microscopic and are laid in masses under the immobile female. The eggs hatch within a few days, releasing dark amber-colored, legged nymphs, or crawlers.

The crawlers move freely along the needles, and many are transported to new hosts by air currents. Most population dispersal takes place during this stage. When the crawlers settle, usually along the flat inner surfaces of young needles, they begin turning into adults.

After the first molt, they secrete a waxy covering that enlarges with subsequent molts to accommodate their growth. The scale coverings, or shells, are grayish black and have a lighter colored central prominence. Its covering distinguishes this insect from a common associate, the pine needle scale (*Chionaspis pinifoliae* (Fitch)), which has a uniformly whitish and narrower shell.

Protected under their shells, females lose their appendages and mobility. They are about 0.1 inch (1 to 1.5 mm) in diameter and more abundant than the males. Males are about one and a half times longer and slightly narrower than the females. Unlike the females, adult males have fully developed legs, antennae, and wings; they can crawl about or fly.

At the northern part of its range, in eastern Washington, the insect has only one generation per year. Males usually emerge and mate with the immobile females between June 1–15, although the dates can vary depending upon latitude and elevation. The eggs hatch into crawlers between July 15 and August 7. Crawlers begin settling around 2 to 3 weeks later, and the insect overwinters in its adult stage.

At the southern end of its range, the insect often has two generations per year. In southern California, the first generation of crawlers develops from May 15 to June 15; the second generation from August 1 to 15. And if fall and early winter are warm, some scales start a third generation before overwintering.

Control

Infestations are commonly associated with environmental conditions that disrupt the normally effective control exerted by the scale's natural enemies. Accumulations of dust from roads, excavations, or industrial plants, for example, have been known to cause outbreaks. Around orchards or mosquito habitat, repeated use of insecticides may also be associated with outbreaks if the spray harms the scale's natural enemies.

Natural enemies that normally keep black pineleaf scale populations at low densities include several species of parasitic wasps, of which a species of *Encarsia* is most important. Ladybird beetles also prey on this insect.

In addition, the rapid onset of freezing temperatures can reduce scale populations, particularly in areas where the microclimate is such that the scales do not become conditioned to cold.

Infestations can also be reduced below damaging levels by properly timed insecticidal sprays or trunk implantations of systemic insecticide.

Scale populations apparently become adapted to individual trees and, therefore, may not rapidly colonize nearby host trees of the same or other species. This adaptation indicates that maintenance of forest stand diversity may decrease the potential of widespread outbreaks.

Assistance

More information about the control of the black pineleaf scale is available from a Cooperative Extension Agent, the local State Forestry office, or the Forest Pest Management staff, U.S. Department of Agriculture, Forest Service. Persons planning to use insecticides to control this insect should check to see if the material is registered for that purpose and follow label directions.

Selected Bibliography

Edmunds, George F., Jr. Ecology of black pine-leaf scale (Homoptera: Diaspididae). Environmental Entomology 2(5):765-777; 1973.

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